Urinary Excretion of S-Alkyl Mercapturic Acids as Biomarkers for the Exposure to Electrophilic Precursors in Tobacco Smoke

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We determined S-methyl mercapturic acid (MMA), S-ethyl mercapturic acid (EMA), S-(3-hydroxy)propyl mercapturic acid (HPMA), S-cyanoethyl mercapturic acid (CEMA) and S-(2-hydroxy)ethyl mercapturic acid (HEMA) in urine of 68 healthy subjects (41 nonsmokers and 27 smokers). Mean urinary excretion rates (μg/24 h) in nonsmokers were 64.0 (MMA), 13.0 (EMA), 653.8 (HPMA), 1531.8 (CEMA) and 700.0 (HEMA). The corresponding values for smokers were 72.4 (MMA), 14.3 (EMA), 1624.5 (HPMA), 1797.0 (CEMA) and 529.7 (HEMA). All differences between smokers and nonsmokers except that for HPMA ($p < 0.001$) were statistically not significant. In smokers, HPMA excretion was significantly correlated to smoking dose parameters such as daily cigarette consumption ($r = 0.44$), plasma cotinine ($r = 0.53$) and urinary cotinine ($r = 0.55$). Urinary MMA and EMA excretions were also correlated to the smoking dose, however, the correlations were weaker. Our results suggest that the smoking-related inhalation of acrolein giving rise to HPMA formation significantly contributes to the formation of urinary thioethers. The precursors of the other mercapturic acids in tobacco smoke are probably of minor importance for the thioether formation in smokers.